В ходе расчетов, были получены соотношения для векторов начальных узловых сил, соответствующих методам начальных напряжений и начальных деформаций. Далее была установлена сходимость методов начальных напряжений и начальных деформаций, использующих полученные соотношения.

Таким образом, на основе итерационных процедур и методов начальных напряжений и начальных деформаций построены вычислительные алгоритмы для решения актуальных задач деформирования.

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THE THEORETICAL STUDY OF THE JUMP-LIKE MOTION OF THE PLANE DOMAIN WALL IN FERROELECTRIC

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The domain kinetics during polarization reversal, being an attribute of ferroelectrics, has been studied intensively. It was shown that domain wall (DW) motion essentially depends on experimental conditions. The understanding of the sideways wall motion is very important for creation of the precise tailored domain structures [1]. The frequently observed jump-like motion of the DW still needs the theoretical interpretation. The proposed explanation of the jerky DW motion is based on the kinetic approach, which takes into account the analogy of the domain kinetics and the first-order phase transition [2]. The theoretical description of the nonmonotonic DW motion caused by the external circuit feedback was demonstrated [3]. The influence of the screening retardation on the DW kinetics was taken into account [4].

The polarization reversal by motion of the single DW in the ferroelectric capacitor serious connected in the electric circuit with resistor playing the role of negative feedback was considered. The existence of the intrinsic or artificial surface dielectric gap (dead layer) located at the interface between the ferroelectric and electrode. Generalized Rayleigh nonlinear differential equation has been written for DW motion.

It was demonstrated by numerical simulation that for proper parameters of the circuit the essentially nonmonotonic DW motion can be realized. Such polarization reversal resulted in switching current consisted of individual pulses. It was demonstrated how the general concepts of the kinetic approach can be further developed to

obtain the quantitative description of the interplay between the domain kinetics and screening retardation. Also we analyze the possibility to observe the effect of frequency locking of domain motion. This effect occurs, when the oscillation frequency of the wall motion in ferroelectric capacitor becomes equal to the frequency of a small regular variation of the applied external voltage. It is shown that the frequency interval of the effect depends on amplitude of the alternating component of external voltage. We calculate the amplitude-frequency range of existence of the frequency locking effect.

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THE COLLINEAR GENERATION OF THE TERAHERTZ RADIATION IN PERIODICALLY POLED FERROELECTRIC MATERIALS

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It was shown by theoretical analysis that the intensity of terahertz radiation generated in periodically poled ferroelectric materials with quasi-phase matching (QPM) is comparable with the intensity at optical frequencies.

It is known that the generation of the coherent terahertz (THz) radiation can be realized in periodically poled ferroelectric material with the domain structure period corresponding to quasi-phase matching [1-3].

The theoretical analysis of the multi-frequency collinear interactions (ω_1, ω_2, $2\omega_1$, $2\omega_2$, $\omega_1+\omega_2$, $\omega_2-\omega_1$) in quadratic-nonlinear crystal was performed. The obtained systems of equations describing the effects of generation waves in periodically poled ferroelectric material, energy transfer between the interacting waves, linear absorption and generation of backward waves was derived. The systems of nonlinear differential second-order equations and differential shortened (first-order) equations were compared.

Numerical calculations were performed with the parameters of lithium niobate crystal for generation terahertz radiation as difference-frequency [4-6]. A comparative analysis of the numerical solutions for obtained systems of equations demonstrated